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The International Commission for Synoptic Weather Information

By Lieut.-Col. E. Gold, F.R.S.

The meeting of the International Commission for Synoptic Weather Information in London during the week 29th May to 2nd June marks another stage in the progress towards the ideal of the world weather map. The Commission used to be known as the Commission for Weather Telegraphy, but, like many children, it became dissatisfied with the name which its parents gave and adopted a new title at Utrecht in 1923, with the consent of its parents. Many people think the old and simpler title is the better, but the use of the word "synoptic" has become so extensive in meteorological circles that it was almost inevitable that the Commission should eventually become known as the Synoptic Commission.

Meetings of Commissions usually follow one another with intervals of three years, but in this case an interval of less than two years has elapsed since the previous meeting (at Zürich in September, 1926). In the interval between the two meetings the International Radio Telegraphic Conference had met at Washington in the autumn of 1927 and had been duly "seized" of the claims of synoptic meteorology in radio telegraphic matters. Meteorological reports for synoptic purposes are practically useless unless they are received very quickly—the ideal of the forecaster is a series of synoptic charts the last one giving an instantaneous view of the existing meteorological situation at the moment when he is putting the last touch on his forecast. At present the ideal is unattainable: progress

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towards it was made when the International Telegraphic Conference at Paris gave international priority to meteorological messages: it has been further assisted by the grant at Washington of the same priority in respect of radio telegraphic messages.

An even more important matter, from the point of view of synotic meteorology in Europe, was the resolution of the Washington Conference that two wave-lengths should be reserved for use, in Europe, in the distribution of collective synoptic reports. The Synoptic Commission had to decide whether each country issuing collective synoptic reports should be asked to adopt one or other of these two wave-lengths or whether the existing scheme for the exchange of reports in Europe should be replaced by a different one. The Commission took the view that the scheme of exchange of reports should be changed. At present it is necessary for each country which desires to have a complete synoptic chart for the European area to arrange for the reception of between twenty and twenty-five wireless issues made by different stations on different wave-lengths. Under the new scheme proposed by the Commission the reports from all the countries of western Europe would be issued from a wireless station on one of the reserved wave-lengths in France; those from the rest of Europe, excluding Russia and the Balkans, would be issued from a station in Germany on the other reserved wave-length. The reports from Russia and Siberia would be transmitted from an existing station whose wave-length is already fixed and is different from the wave-lengths used for the rest of Europe. The re-transmission of the reports for south-eastern Europe and Asia Minor would be either from an existing station or from a station with one of the two reserved wave-lengths, at a time when the stations in France and Germany were not transmitting on that wave-length. Details of the arrangement have been referred for elaboration to a special sub-commission. If and when the arrangement can be put into operation it will not merely make it easier for services to arrange for the reception of the necessary reports, but it will also largely remove the difficulties which arise from the non-reception of many reports from distant countries, issued from stations of comparatively low power.

The second important question considered by the Commission is comparatively new. The ocean constitutes about two-thirds of the surface of the globe and the meteorology of the ocean has been studied practically only in its statistical or climatological aspect. Efforts have been made by different countries in the last 20 years to develop the synoptic representation of the ocean but the result, though extremely useful to forecasters in Europe, has been lamentably inadequate when compared with the synoptic representation of land surfaces. International co-operation is as vital for the synoptic meteorology of the

ocean as it is for that of the land, but it is much more difficult to achieve. The co-operation has necessarily to be of a different character because the ocean cannot be parcelled off among different countries: observing stations (ships belonging to different countries, *e.g.*, France, Norway, Holland, America, Great Britain, will all be required for the representation not merely of the whole ocean but of any part of it. A special sub-commission had been appointed at Zürich to consider the method of collecting and distributing these reports. The sub-commission met in Paris in May under the chairmanship of General Delcambre, Director of the National Meteorological Office of France, and prepared a scheme for the consideration of the Commission. The Commission gave its approval to the scheme which includes the collection of reports from all ships at selected wireless stations and for the repetition of the reports received for the benefit of all countries. It is anticipated that one collecting and distributing centre will be at the Azores. The scheme further provides for the reports to be made in a universal code and for the observations to be made at standard hours of Greenwich time in all the oceans. Steps will be taken in the matter of consulting the services interested as soon as possible so that the approval of the International Meteorological Committee to a definitive plan may be obtained when the Committee meets in 1929.

At the meeting of the Commission held in London in 1920 a new International Code was adopted for use in telegraphic meteorological reports, and this was approved by the International Meteorological Committee in 1921. The code marked a great advance on the pre-war codes but at the time of its introduction neither the Norwegian ideas of the polar front nor the French ideas of the systems of cloud had been much developed: these ideas profoundly affect modern forecasting; they must therefore affect the conception of a code for telegraphic reports. Moreover as the meteorological map extends in area, the necessity of a world-wide code becomes increasingly obvious. The revision of the code prepared in 1920, which applies primarily to the temperate zone, is therefore inevitable if it is to become universal and in conformity with the recent advances in meteorological science. The first steps towards its revision were taken at the meeting at Utrecht in 1923; further advance was made at Zürich in 1926; and at the recent meeting a new code was prepared which is designed to meet requirements in all countries: polar, temperate and tropical; and to give an adequate description of those skies which are found to be characteristic of different "air." This new code also is to be communicated to meteorological services in all countries for their consideration, preliminary to a decision being taken at the meetings of the Conference and Committee next year.

Lastly, the Commission, which is composed of men who are face to face both with the practical difficulties arising from diversity of units and with the difficulties arising from a change in the unit used in their own services, resolved by 15 votes to 2 that in synoptic messages issued by wireless telegraphy for international exchange the pressure will be expressed in millibars. The dissentients were Dr. la Cour, of Denmark, and Dr. Pouichet, of Russia, who expressed himself as favourable to the proposal though he did not consider that it would be at present practicable to introduce it in the Russian Meteorological Service. The Commission did not feel able to arrive at a similar decision in regard to temperature—possibly because no Bjerknes has yet found the thermal counterpart of the millibar: but it requested one of the sub-commissions to "examine the question of the unification of the reports of temperature in international messages on the basis of the Centigrade scale."

Nearly all the European members of the Commission were present at the meeting and for the first time since the war, representatives of the United States of America attended, *i.e.*, Dr. Marvin, Chief of the U.S. Weather Bureau, and Mr. E. B. Calvert, Head of the Forecast Service of the Bureau.

The arduous work of the business meetings of the Commission was relieved very sociably by a reception by Dr. and Mrs. Simpson at the Meteorological Office, on Tuesday, 29th May, very hospitably by a luncheon given by the Government on Thursday, 31st May, and very instructively by a visit arranged by the Royal Meteorological Society to Croydon Aerodrome on Thursday afternoon, 31st May. The week of the meetings was one of very pleasant weather—by coincidence.

The Seventh Cruise of the *Carnegie*

By R. E. Watson, B.Sc., Ph.D.

On the morning of 1st May, 1928, the non-magnetic brig *Carnegie*, decked out in new white paint, new masts and sails, left Washington on a three-years' cruise over tracked and trackless seas. To the world of science, to navigation, to surveyors and explorers, this event was of extreme importance, for the *Carnegie* is one large floating laboratory, with physical, chemical and biological sections, in which, for three years, intensified scientific research will be pursued over every ocean of the world.

Up to the end of the 15th century, it was thought that the compass needle always pointed in a fixed direction towards true north. Then during the progress of his voyage across the

Atlantic, by observation of the stars, Columbus discovered a shift of the needle from true north, whereupon it is stated, he turned his compass card round to correspond to the variations of the needle in order to allay the suspicions of his crew. Now, of course, we know that the compass needle is directed towards the magnetic north pole which lies about 1,000 miles from the geographical north pole in latitude 70° N. and longitude 96° W.; approximately. It was not, however, until 200 years after Columbus's discovery that the astronomer Halley, in 1698, conducted extensive observations over the sea of the difference between the pointing of the compass needle and the geographical north, that is the magnetic declination. This led to the issue of his now famous declination charts upon which mariners depended for a long time afterwards. Similar charts at the present time are very much altered owing to the rapid changes which have taken place in the earth's magnetic state since Halley's time. To give some idea of the changes which have actually occurred, taking London as an example, if we go back to Queen Elizabeth's time (1580), the magnetic declination had its largest easterly value then, namely 11° E. It gradually diminished until about the time of Cromwell's death (1658), when the magnetic north coincided with the geographical north. From this time the declination increased in a westerly direction until about the time of the Retreat from Moscow (1812), when it had its maximum westerly value of 24° W. Since then the westerly declination has decreased at a variable rate, until at the present time it is 12½° W. In London for the past ten years the average rate of decrease of westerly declination has been one minute of arc per month, or one-fifth of a degree per year, while over the Indian Ocean the change has been more rapid, being about one-third of a degree per year. Thus it will be seen that simply for purposes of navigation and surveying by compass needle it is absolutely necessary to keep track of the magnetic changes going on over the earth.

On land continuous magnetic changes are recorded at fixed observatories, while periodic surveys serve to determine variations in the rate of change over large areas. Over the oceans, however, observational work is not so easily organised, and special voyages must be undertaken to keep information up to date.

Soon after its inception in 1904, the Department of Terrestrial Magnetism of the Carnegie Institution of Washington decided to put declination charts over the ocean on a correct footing if a suitable ship could be found. The main consideration was to have as little iron as possible in the construction of the vessel so that magnetic observations would be unaffected by local magnetic material. A sailing ship, the *Galilee*, was chartered to undertake, in the first place, a magnetic survey

of the Pacific Ocean. Between 1905 and 1908 three cruises were made, but from the experience gained, it was proved conclusively that for ocean magnetic surveys, it was necessary to have a vessel designed with the special needs in view, in fact, a true non-magnetic ship.

To meet these needs, the *Carnegie* was built, and launched in 1909, and she can truly lay claim to her description of non-magnetic. She is a brig built of white oak with her keel and hull sheathed in copper. Her rigging is of hemp, not steel, while her pure bronze anchors are carried by heavy Manilla cable, 11in. diameter. Her galley ranges, locks, pots, pans, rails, bolts, nails, etc., are all made of copper, bronze, or gun metal, and even the buttons of the crew's uniforms are of bone or brass. Although speed is not the predominant note in her design, under full canvas in a favourable wind she can move with the speed of an ocean liner. She is not dependent, however, solely on the wind, but is fitted with a 100-h.p. bronze engine which will carry her along at six knots in a calm. The engine is an internal combustion one, which, owing to the difficulty of storing (and in some regions of procuring) petrol, is run on producer gas, and only a few essential parts of the engine are of steel. In all there is only about one ton of iron in the whole of the brig, and this is all so far removed from the magnetic instruments in the deck houses as to be quite ineffective. The vessel is constructed on the very best lines, combining the finish and workmanship of a yacht with the sturdy strength of a merchant ship.

The main purposes to be served by the *Carnegie* were the changes in the magnetic elements all over the globe; special problems concerning seasonal, annual and secular variations, magnetic storms and aurorae, the connexion between magnetic disturbances and the 11-year sunspot period and to test theoretical considerations of the origin of the earth's magnetic field. Later on with the improvement in instrument design and observational methods it was decided to make atmospheric electrical observations and regular readings of the earth's electric field, conductivity of the air, ionic content and radio-active content of the air were made.

Six cruises have already been made and all the oceans have been surveyed several times. Since the magnetic work on the present and seventh cruise is primarily to secure secular variation data in terrestrial magnetism, the route to be followed will cover as nearly as possible that of previous cruises, but the programme of work has been considerably enhanced. In addition to the magnetic and electrical investigations, it has been arranged to carry out researches in physical and biological oceanography.

For the measurement of the magnetic elements, declination, horizontal intensity and dip, instruments and methods of observing have been improved to give the best results for a minimum expenditure of labour and time, so that more time is available for other work. In the atmospheric electrical programme, besides taking records of the conductivity of the air, it is proposed to study diurnal variations of the earth's electric field at more widely distributed stations than previously, in order to test the suggestion that such variations progress according to universal time, a deduction first indicated by results obtained on the *Carnegie*. Additional measurements of the penetrating radiation, or "cosmic rays" are to be taken with a new Kohlhörster instrument, special regard being taken of the variations with time, geographical position and depth, with the corresponding salinity and temperature of the water. Nuclei in the atmosphere will be counted with an Aitken dust-counter and correlated with the ionic content and conductivity of the air. An attempt will also be made to measure marine electric currents by trailing electrodes on cables from the stern of the vessel.

Investigations in physical oceanography allow for a study of the topography and configuration of the ocean bed. Every 150 to 200 miles the ship will be kept stationary for four or five hours by sea anchors while soundings are made with a sonic depth finder, up to a maximum of 20,000ft. Temperature and pressure will be measured, and samples of water at various depths will be obtained for analysis.

The marine biology work will consist mainly of the determination of the distribution and abundance of plankton (the fundamental food supply of fish) and other small organisms down to a depth of 600ft. In shallow water dredging will be carried out to bring to the surface diatoms and foraminifera for microscopic study, while in certain isolated regions specimens of porpoises, dolphins, birds, &c., will be collected.

Marine meteorology will be studied by observations of barometric pressure, wind direction and velocity. Also, in view of the effect of ocean currents on climate, the interchange between the surface of the ocean and the air above it will be obtained by measurements of the lapse rates of temperature and humidity in the first 100ft. above the sea. Solar radiation observations will also be carried out.

The *Carnegie* carries a staff of seven scientists and a crew of seventeen men under the command of Capt. J. P. Ault, who was in command on her 3rd, 4th and 6th cruises. She will visit 26 foreign ports, in each of which she will stay for anything from 2 to 25 days free of all duty or port charges, a courtesy extended to her for her services to navigation. During re-victualling in port opportunity will be taken for a comparison

of instruments with any land stations that may be conveniently available. The *Carnegie* has already visited Plymouth, Hamburg and Reykjavik and thence is now on her way to Barbados, which should be reached by the end of September next, after 50 days at sea. She will return to Washington about September, 1931, with a cargo rich in scientific treasure, having added 105,000 miles to her previous 291,000 miles voyaging.

Royal Meteorological Society

By permission of the Air Ministry a special meeting of the Society was held at Croydon Aerodrome on 31st May, 1928. After a brief address of welcome by Sir Richard Gregory, President, supported by Dr. G. C. Simpson, Director of the Meteorological Office, a Lecture on the "Development of Meteorological Services for Aviation" was delivered by Capt. F. Entwistle, Superintendent Aviation Services Division, Meteorological Office. Capt. Entwistle explained the organisation by which pilots were not only informed of the weather conditions over the route they were flying at the time of the commencement of the flight, but also of the changes likely to occur and the prevailing conditions at neighbouring stations, so that an alternative route could be taken in the event of bad conditions on the normal route.

Tea was provided at the Aerodrome Hotel and afterwards guides conducted parties to the various points of interest in the Aerodrome. A popular feature of the afternoon was the opportunity provided by Imperial Airways Ltd. to make short flights at a reduced charge in commodious air liners specially detailed for this purpose. About one-third of the company took advantage of this opportunity to make an ascent.

About 200 Fellows and their friends were present, including representatives from the International Commission for Synoptic Weather Information, who were attending a Conference at the Air Ministry.

The monthly meeting of this Society was held on Wednesday, 20th June, at 49, Cromwell Road, South Kensington, Sir Richard Gregory, LL.D., President, in the chair.

Report on the Phenological Observations in the British Isles, December, 1926, to November, 1927.

1927 was summarised by the Meteorological Office as "A wet year with a dull and wet summer." As in many recent years, early warmth, inducing also early bloom on fruit trees, was precursor of destructive cold spells in April, May and even early June, when sunless drought prevailed as well. Then followed a wet, cool, sunless summer. But in the yearly totals tempera-

ture and rainfall make a fair showing. It is when these data are considered by the quarter, still more month by month, or week by week, that their mischievous nature is apparent. An additional table of some interest compares land and sea temperatures around the coasts of Great Britain. The average sea temperatures were 48°, 50·5°, 53° on the east, west and south coasts respectively for the year. For the phenological nine growing months, December to August, these values were 47·8°, 49·3°, and 51·3°, respectively 1°, 2° and 1° warmer than on the adjacent land. On all coasts the sea was coldest in February, warmest in August; in the west and south colder in May than November. The mean flowering date was actually early, though after May practically all were late. The early migrants, on the other hand, were retarded two days, the later were a day early. The final results for farming were bad; in many parts, especially north-east Scotland, disastrous. Only apples and raspberries gave a good fruit crop, but the exceptional wet coolness gave a wealth of herbaceous blossom. October was the only redeeming feature in the latter half of the year.

C. K. M. Douglas.—On the relation between temperature changes and wind structure in the upper atmosphere. (Memoir Vol. I., No. 7).

On the assumption that the wind velocity is "geostrophic," the horizontal gradients of temperature in the free air can be deduced from the variation of wind with height at a given time, and the temperature changes due to purely horizontal movements readily follow. (This subject has been developed chiefly by Shaw in this country and by Exner on the Continent, the latter giving a formula for the change of temperature at a given point.) This paper gives a comparison between the temperature changes calculated on the above assumptions, and the observed temperature changes based on a considerable number of observations for the years 1920 to 1925 inclusive. The results show that the correlation between the observed and theoretical changes is a little less than 0·5, both for 6-hour and 24-hour time-intervals, but is higher for large temperature changes.

R. M. Poulter.—Simple formulæ for computing relative humidity.

By means of the formulæ given in this paper relative humidity can be calculated readily from readings of dry and wet bulb thermometers without reference to tables. For air temperatures around 60°F. the "relative dryness" of the air is given by $\frac{1000}{3} \times \frac{\text{depression of the wet bulb}}{\text{dry bulb reading}}$ The required relative humidity is given by subtracting this "dryness" figure from 100. Slight modifications of the $\frac{1000}{3}$ provide for a range from

below freezing point to about 120°F. Primarily intended for mental use with the Fahrenheit scale, the formulæ can be adapted to Centigrade readings simply by adding 18 (or strictly 17·8) to the dry bulb reading before making the computation.

Correspondence

To the Editor, *The Meteorological Magazine*

Phenomena Preceding Lightning

In the *Meteorological Magazine*, June, 1928, p. 113, Mr. R. S. Breton writing from Tung Sung, S. Siam, states that on a number of occasions he has noticed a sharp "vit" or "click" accompanying lightning that has struck something in the immediate neighbourhood, preceding the thunder by a perceptible fraction of a second.

He adds that he has three times noticed that animals show alarm immediately before a flash, and that in one case a dog walking on grass turned and began to bark angrily in the direction of a very strong flash that came ¼ second after, striking several of a group of trees 200 yards away. He mentions two occasions when fowls rushed for shelter from the open in alarm before a very near discharge actually took place. In each case the discharge was a very powerful one, taking place on dry soil before rain had fallen. He asks "if it may be that the sensitive feet of the dog could detect vibrations before the discharge took place."

The Editor of the magazine answers "that the 'vit' or 'click' accompanying lighting which has struck close by appears to be new; no reference to any similar observation can be found in the literature, and at present it is not possible to offer any explanation."

Clicks, preceding intense lightning flashes are common at Blue Hill Observatory and undoubtedly can be heard elsewhere under certain conditions, when an insulated metallic conductor is exposed in a strong electric field, and a grounded conductor is close by. At Blue Hill every intense flash within a radius of 1,000 metres gives this click preceding thunder by an interval which is a function of the distance of the flash.

Intervals as large as 6 seconds indicating a flash distant 2 kilometres or more, have been noted.

Regarding the behaviour of the dog, it would seem to be not so much a question of sensitive feet, as a matter of insulation, and increasing electrification, to a degree that the hairs for instance become discharging points. This bristling can be seen readily on animals caught in thunderstorms near the top of a

mountain. I recall being near the summit of Mt. Whitney (4,420m. above sea-level, 14,502ft.) during a thunderstorm. The hairs of the burros (pack animals) stood out straight, and a faint hissing could be heard. A metal button on my cap gave a tingling sensation. I kept wondering how long it would be before a flash of lightning would demolish the entire party of astronomers as they proceeded in close formation to the summit. I think we had a narrow escape from disaster. During a week's stay at the summit, we had several thunderstorms, when the lightning seemed to be below us.

The feeling of uneasiness preceding lightning flashes may be due, aside from effects of pressure, temperature and humidity, to the increasing electrical strain, as a charged cloud comes over the position of the observer. We know from our quadrant electrometer measurements that at such times the potential gradient increases steadily from 50 volts per metre to ten thousand or more. A jet of water from an insulated collector exhibits many interesting changes as the charged cloud approaches. In fact, we can tell just about when the flash will occur. We can also detect and record discharges which an observer fails to detect, if dependent on the eye alone. With each flash there is an instantaneous equalisation of potential and return of the index spot of light to zero.

ALEXANDER MCADIE.

Harvard University, Blue Hill Observatory, Mass., U.S.A. 10*th July*, 1928.

Unusual Thunderstorm Phenomena

With regard to the correspondence in the issues for June and July, 1928, I have heard on two occasions a "click," or "crack," accompanying a comparatively near discharge of lightning.

In the course of a rather severe thunderstorm during the evening of 12th July, 1924, I and two other members of the staff whilst in the main building of this Observatory heard a loud, sharp "crack," the sound appearing to come from the direction of the pressure-tube anemograph at the north-west part of the building. We were in a room to the east of that in which the recording portion of the anemograph is situated.

The second occasion was during a thunderstorm on 14th July, 1927. At 15h. 38m., G.M.T., those of us who were in the main building heard a very loud "crack" (somewhat similar in character to the sound which accompanies an electric spark discharge) which slightly preceded a particularly loud crash of thunder. Two of us who were in different rooms at the west end of the building thought that the "crack" sound came from the more easterly part of the building; while of the two people who were situated in the central room (which contains a telephone)

one thought that the sound came from a room to the east and the other that the sound came from the telephone circuit. My wife, who was in a building some forty yards to the west of the main building, heard no "crack," but was sufficiently impressed by the violence of the particular crash of thunder to look to see if the main building had been struck. Careful examination of the ordinary magnetic records reveals a perceptible faintness of the photographic trace for about a minute after 15h. 38m.; thus indicating that the recording magnets were oscillating after a sudden displacement caused by the magnetic field change associated with the lightning discharge. The magnitude of the presumed initial sudden displacement cannot be determined. A much larger effect is seen on the photographic record obtained of the indications of a galvanometer connected to a large loop of insulated cable resting on the ground to the north-west of the Observatory.

The main building is furnished with a lightning conductor.

H. W. L. Absalom.

The Observatory, Eskdalemuir, Langholm. 23rd July, 1928.

Ancient Hindu Meteorology

Various Indian weather lores have already been recorded but perhaps it is not widely known that ancient Indian *rishis* or savants also speculated on meteorological problems with a scientific touch. Readers of the *Meteorological Magazine* may be interested to know that an antiquarian scholar and the owner of a unique private museum of curios in Bombay, Mr. Purushottam Visram, has collected a number of rare Sanskrit manuscripts. For want of facilities it has not yet been possible to study these valuable records in detail. Mr. Visram, however, has published one of his lectures on the natural philosophy of ancient India, delivered before the seventh Gujarati Literary Conference held at Bhavnagar in 1924. In this lecture he mentions a list of forty-nine different scientific treatises by different ancient *rishis* now in his possession.

Of these treatises the one by Angiras entitled *Meghautpatti* (*On the origin of rain*) is of interest to meteorologists. Angiras mentions twelve kinds of clouds and their nine forms and discusses the processes of their formation. He describes twelve different kinds of rain, sixty-four kinds of lightning, the causes of thunder, thirty-two kinds of thunder and twenty-one kinds of thunderbolts and speculates as to how and when thunderbolts occur. He also mentions eight varieties of hail and the relation between the size of raindrops and the growth of insects. In another treatise the same *rishi* discusses the physical aspects of the incidence of sun's rays on clouds, the modification of solar radiation by the intervention of clouds and the

effect of the radiation so modified on the growth of seeds. The exact date when Angiras lived cannot unfortunately be given accurately, but he certainly was one of the celebrated *rishis* in the hoary *vedic* age. It is regretted that further details cannot be given unless and until the old manuscripts are carefully studied by a competent Sanskrit scholar.

S. N. SEN.

Poona. May, 1928.

The Folklore of Storms

On 8th July Shanghai was visited by a severe typhoon. According to the official Chinese mythology such disturbances are caused by the flight of one of the Dragon Kings, but apparently on this occasion the natives preferred to attribute the tempest to the "spirit" of the late Marshal Chang Tso Lin.

Such a belief in regard to sudden storms is wellnigh worldwide and a few examples may be of interest.

On 27th August, 1590, Pope Sixtus V lay dying in Rome, and as he breathed his last a storm broke over the Quirinal Palace. The superstitious Roman populace fully believed that the Evil One had come to carry off the soul of the unpopular Pontiff in the storm.

In Germany when a sudden wind blew it was long said someone had hanged himself—the spirits were welcoming their comrade. In France it was the Wandering Jew passing by. In Scotland and Ireland the little dust-whirls that spring up on a hot day are due to the fairies, but the Irish also say that such a whirl is a company of souls, and if a piece of paper is caught up by the whirlwind it is the soul of an unbaptised child going to burial.

The tornado of the United States ought to have a place in the folklore of the American Indians but the writer is not aware of any myths referring to it.

Examples of similar beliefs to the above could be given from Arabia, (the "Jan"), South America, Australia and Fiji. There is a good collection in Sir James Frazer's monumental work the "Golden Bough."

This information was supplied to the writer by Miss I. Grubb, of Seskin.

CICELY M. BOTLEY.

17, *Holmesdale Gardens, Hastings.* 10*th July*, 1928.

Screen Minimum Temperatures at Cranwell during Radiation Nights in Early Spring

In the *Meteorological Magazine* for February, 1928, p. 20, the present writers gave approximate equations for the determination at Cranwell, Lincolnshire, of screen minimum tempera-

tures during radiation nights in winter derived from a consideration of data of the preceding 15h. In view of the importance of frosts in early spring to agriculturists and others, it was thought desirable to extend the inquiry to that season, defining early spring as the months of March and April. The period examined stretched from 1st March, 1921, to 30th April. 1927, and a " radiation night " was defined as in the previous note, but the data for relative humidities and dew points employed were those of the preceding 18h. instead of the preceding 15h., as it was found that using the later hour gave much better results for the months being considered than did the earlier hour. The wind data were obtained as before.

In determining the equations representing the relationships by the usual graphical method, a two-fold differentiation with regard to wind force during the night was adopted this time in view of the smaller number of available occasions, but the same differentiation with regard to relative humidity was maintained.

As events turned out, however, there were too few cases of radiation nights with a relative humidity of 85 per cent. or more to justify any generalisations. But this is of less importance when it is remembered that, normally, the lower screen minima would be given with the relative humidities at 18h. below 85 per cent. The two equations remaining are shown in the following table, T being the expected night screen minimum and D the dew point at the preceding 18h. They fit the actual results well, there being no very marked divergencies. As in the previous note the equations only hold for values of D greater than 32°F.

Mean wind speed	Relative humidity at 18h.	Equation	No. of cases available
8 m.p.h. or over	below 85%	$T = 0{\cdot}80D + 3{\cdot}5$	34
less than 8 m.p.h.	below 85%	$T = 0{\cdot}75D + 1{\cdot}5$	14

W. H. Pick.
J. Paton.

R.A.F. Cadet College, Cranwell, Lincolnshire. 24th February, 1928.

A Coloured Solar Halo

On 30th June last, at 13h. 50m. (G.M.T.) I saw a brilliantly coloured solar halo from near Banstead Downs, Surrey (midway between Belmont and Carshalton Beeches railway stations). The only part visible was a segment of about 30°, in front of a dark

cumulus cloud, which was at an angular distance of about 20° to the west of the sun. The neighbouring parts of the sky were bright, and no other part of the halo could be seen.

The brightest colours were red, yellow and blue, and the general appearance resembled that of a primary rainbow (except, of course, that the colours were in the reverse order).

I could see no signs of cirrus clouds in the sky and was, therefore, surprised to see this halo, which disappeared when the cumulus cloud had moved away from its position at about 20° from the sun.

L. G. VEDY.

8, Grosvenor Avenue, Wallington, Surrey. 5th July, 1928.

NOTES AND QUERIES

The Warm Spell of July, 1928

The warm spell over southern and south-eastern England for which July, 1928, will be meteorologically remembered may be said to have commenced on the 10th when the shade maximum temperature at Kew reached 77° and to have terminated on the 28th when the shade maximum temperature at the same place was 72° to be succeeded by 67° as the reading on each of the following two days.

The beginning of the month saw a large anticyclone situated between the Azores and eastern North America, whilst a large depression was off the Irish coast. The anticyclone slowly spread eastward from the Azores, but it was not until the morning of the 9th that it could be said to have brought southern England under its domain, depressions having dominated the situation there in the meanwhile. On that date the anticyclone practically spanned the Atlantic between the British Isles and North America and it continued to extend eastward until by the 11th it had covered France and Germany in addition. The huge anticyclone was split by a depression in mid-Atlantic on the 16th, but re-established itself in its entirety on the 21st. The end of the warm spell in England came with the appearance off the coast of Ireland on the morning of the 26th of a small secondary depression which moved eastwards carrying the usual depressional features with its passage and being but the first of a chain of similar disturbances, the anticyclone in consequence receding south-westwards from our coasts.

Some of the figures for London during the spell may not lack in interest. At Kew, the highest shade maximum temperature recorded during the period, the 10th to 27th, inclusive, under review, was 87°F. on the 15th and the lowest shade maximum temperature 73°F. on the 19th. The absolute maximum at Kew

was, however, exceeded at other London stations which reached 90° or more, Greenwich attaining 92° on the 22nd and 91° on the 15th, whilst at Camden Square 92° was recorded on the 15th and 90° on the 14th. No rain fell at Kew during the period 9th to 25th, inclusive. Towards the end of the spell there came two abnormally warm nights. The first was the night of Monday, the 23rd, during which the shade minimum temperature in St. James' Park did not fall below 66°, whilst the second was the night of the following day, Tuesday, the 24th, during which the shade minimum temperature at Camden Square was 67° and at Kensington Palace, Kew and St. James' Park 66°. The comparatively high relative humidities accompanying these high temperatures made the conditions thoroughly oppressive. The high temperatures on the two nights in question are to be ascribed to clouding over preventing the air from cooling at anything but a slow rate. Yet another outstanding episode of London's weather during the spell was the extreme dryness of the air on the 18th when, at 13h., Croydon had a relative humidity of 25 per cent. and Kew of 35 per cent., a condition of things probably due to the slow descent of air from higher levels of the atmosphere.

Outside London, the southern, south-eastern and eastern districts enjoyed during the spell similar genial conditions to the Metropolis, sunshine being abundant and maximum temperatures of 80° or more frequent.

The spell should have done something to remove one rather widespread misconception. There is a common belief that very high surface temperatures must necessarily mean thunderstorms. It is, therefore, worth while noting that, apart from local occurrences in the English Channel on the 15th, no thunderstorms occurred at all in southern England during the spell except towards its very end when they were experienced on the morning of the 27th.

W. H. PICK.

Hot Weather and Thunderstorms

The July of 1928, like that of 1921, was distinguished by high temperatures, but very few thunderstorms. Even when clouds formed, the temperature above them was too high to permit of thunderstorm development, a state of affairs typical of persistent anticyclones. The figures for Kew Observatory for the last twenty years show that there is no appreciable correlation between the mean temperature of any particular month and the number of thunderstorms in that month, for the months May to August taken separately. The correlation co-efficient for July is negative, but it is too small to be significant. Even if one took individual days it is doubtful if one could obtain an ap-

preciable correlation, since many thunderstorms develop in polar currents, with day temperature somewhat below normal, and with temperature in the upper air much below normal, the largest deficiency occurring in the middle and upper levels of the troposphere. There can, however, be little doubt that a relation exists between the number of peals of thunder on any day and the mean temperature of that day, since storms of outstanding violence nearly always occur in comparatively warm weather.

C. K. M. DOUGLAS.

Reviews

Veröffentlichungen des Forschungs-Institutes der Rhön-Rossiten-Gesellschaft. Nr. I, Jahrbuch, 1926-27.

Most of this publication is devoted to problems in aerodynamics, but there are several articles on meteorological subjects. The most interesting of these is by Dr. W. Georgii on eddy winds formed in air currents crossing mountains, which produce local downward currents on the windward side and upward currents on the lee side. The local pressure differences responsible for the eddy winds are attributed to the temperature anomalies produced adiabatically when an air current with a stable lapse-rate of temperature is forced across a mountain.

C. K. M. D.

Wirbelstürme und Sonnenflecken. By O. Myrbach. Ann. Hydr. Berlin. VI., 1928, pp. 52-58, 91-96; and *Haben die Leoniden einen Einfluss auf das Wetter?* By O. Myrbach. Informations Bull. Ukrmets. Band 4-5, 1925-6, pp. 551-561.

The first of these two papers is an attempt to show that the passage of a spot group across the sun's meridian is generally accompanied or followed by a hurricane or typhoon in the tropics or by a tornado or waterspout in temperate regions. The material included a collection of catastrophes all over the world for 1926 and the first half of 1927. The research was difficult because both sunspots and catastrophes were so frequent that without any real connection most sunspots would be attended by a catastrophe, but the author finds that the association is somewhat closer than "expectancy." Isolated spot groups are most dangerous, and tend to give a repetition on their return after a solar rotation; the author discusses whether in certain circumstances a warning would not be justified but concludes that further study is first necessary in order to determine which part of the world should be warned.

One would say that the position which comets held in mediæval meteorolgy was being usurped by sunspots, but the

second paper does something to restore the balance. In 1925 a heavy rainstorm occurred in Vienna on 12th November, which was quite unjustified by the general meteorological situation; there were similar catastrophes in other parts of the world and as the day happened to coincide with the earth's passage through the path of the well-known Leonid swarm of meteors, the author suspected a connexion. His investigations persuaded him that this idea was well-founded, and that the 35-year Bruckner cycle is probably due to the Leonids.

Obituary

Dr. F. A. E. J. Malmgren.—It is with deep regret that we record the death of Dr. Finn Malmgren, the meteorologist of the *Italia*, who after the wreck of the airship while it was returning from the North Pole to Spitsbergen, lost his life in a gallant attempt to cross the ice to North-East Land.

Although he was only 32 years of age, Malmgren had acquired great experience in Arctic expeditions, both by sea and air. After studying at the University of Uppsala, he assisted Professor Hamberg at the high-level observatory of Portetjäkko, afterwards serving at the Meteorological Observatory of Uppsala, and at Professor Pettersson's Hydrographic Institute at Bornö. In 1922 he joined Captain Amundsen's Arctic expedition in the *Maud*, which drifted in the polar ice for two years. Although he did not return until 1925, in the following year he joined the Amundsen-Ellsworth expedition in the airship *Norge* which crossed the North Pole in the course of a flight from Rome to Alaska. He was next appointed lecturer in meteorology at the University of Uppsala, but gave up this work to join the expedition in the *Italia*.

So full a life left small time for writing, and Dr. Malmgren's great knowledge of meteorological conditions in the Arctic has been lost almost without record. His best-known paper is his discussion of the humidity and hoar frost observations during the *Maud* expedition; he also contributed a chapter to Amundsen and Ellsworth's history of the *Norge*—"The First Flight across the Polar Sea." In this country only those who had the opportunity of meeting him at Pulham can appreciate the magnitude of the loss which science has sustained in his untimely death.

Flight Lieutenant Lance Harold Browning, M.C., D.F.C., R.A.F.—We learn with regret of the death of Flight Lieutenant L. H. Browning, who was killed in a flying accident at Holbeach Ranges on 2nd August.

Flight Lieutenant Browning was one of the first officers to be appointed for meteorological duties in connection with the Royal Air Force in the Middle East. He was attached to the

Meteorological Office, Air Ministry, for instruction in 1920 and in December of that year proceeded to Iraq where he was in charge of the Royal Air Force Meteorological Section. It was largely due to his zeal and capable organisation in conjunction with Squadron-Leader Oxland that the Royal Air Force Meteorological Service in the Middle East was successfully established. During his subsequent service in Egypt he not only maintained the essential meteorological organisation for the Royal Air Force, but carried out a valuable special programme of upper wind and free air temperature observations in connection with the airship development programme.

On his return to this country in 1925, Flight Lieutenant Browning relinquished meteorological work for general flying duties, but he always maintained a keen interest in meteorology and made good use of the knowledge acquired in applying it to flying. All who knew him will deeply regret his death, not only on account of his ability as an officer but also because of his charming and likeable personality. F. E.

Miss E. D. Anderson.—The death occurred on 19th July, 1928, of Miss E. D. Anderson, the pioneer of women's work so far as the Meteorological Office is concerned. Miss Anderson started work on 1st January, 1883, in connection with the preparation of "Synchronous weather charts of the North Atlantic and the adjacent Continents, 1st August, 1882, to 3rd September, 1883," and retired in 1913 on account of ill-health after more than thirty years' service.

Dr. C. Chree.—We regret to record the death on 12th August of Dr. Charles Chree, Superintendent of Kew Observatory from 1893 to 1925.

The Weather of July, 1928

Fine, warm, dry, sunny conditions prevailed in general during July although for the first week the unsettled and rather cool weather so prevalent in June continued. A belt of low pressure, maintained from mid-Atlantic to Scandinavia, gave rain at times but bright intervals in most districts from the 1st to 4th; among the heaviest falls were 2·15in. at Sawrey (Lancs.) and 1·30in. at Eskdalemuir on the 1st, 0·78in. at Crowborough on the 3rd and 3·19in. at Bettws Garmon (Carnarvon) on the 4th. After this there was a general improvement in the south although slight rain was experienced at times until after the 9th. A belt of high pressure with a separate centre to the south-west of England then became firmly established, but depressions moving south of Iceland caused a gale at Blacksod Point on the 11th and general rain in Scotland and northern England; 2·60in. fell at Sawrey (Lancs.) and 2·18in. at Grange (Lancs.) on the 10th. Thereafter, although rather

unsettled weather continued at times along our north-west seaboard, the high pressure system remained the dominating feature until the 25th. A period of dry, fine weather set in over nearly the whole country with brilliant weather over the southern half of the kingdom and a rapidly rising temperature. More than 15 hours of bright sunshine were enjoyed at many places on several days and temperature rose above 85°F. locally in the 12th, 13th, 14th, 15th and 22nd. 90°F. was reached at Tottenham on the 15th and 92°F. at Greenwich on the 22nd for the first time since July, 1923. On the 14th 15·5hrs. of sunshine at Ross-on-Wye constituted a record for the station for July. Jersey also had 15·5hrs on the 12th and Harrogate 15·5hrs. on the 15th. With 15·3hrs. at Edgbaston (Birmingham), the 14th was the sunniest day there for 41 years. A depression over Iceland moving east-south-east broke the dry spell over Ireland and Scotland on the 22nd and 23rd. In England rain fell generally on the night of the 26th-27th and thunderstorms occurred at many places, 2·30in. of rain fell at Chale (Isle of Wight) on the 27th and Mr. J. E. Cowper informs us that 2·04in. fell at Ventnor and 1·83in. at Shanklin, mostly between 2 and 4 a.m. on the 28th. This brought to an end an absolute drought that had lasted for 26 days at Llanthony Lock (Glos.) and 22 days at Chatteris (Cambridge), Felsted (Essex) and Melbury House (Dorset). Cooler and less settled conditions, with rain locally, prevailed until the end of the month over the whole country. The total sunshine for the month was above normal in the south, but below normal in the north. The total of 291hrs. at Kew was 90hrs. above normal, that of 255hrs. at Falmouth 30hrs. above normal and that of 202hrs. at Dublin 52hrs. above normal. At Stornoway, however, there was a deficit of 63hrs. and at Valentia one of 11hrs.

Pressure was above normal over western and south-western Europe, the excess reaching 5.3mb. at Scilly and 4.5mb. at Madrid. With the exception of southern Gothaland pressure was below normal over the Scandinavian peninsula, Spitsbergen and Iceland, the greatest deficit being 11.3mb. at Vardo. From Iceland a trough of pressure slightly below normal extended southwards to the Azores. Temperature was above normal and rainfall below normal except in Scandinavia; over Sweden as a whole the rainfall was normal, a deficit in south-eastern Gothaland compensating for an excess in northern Norrland.

Severe thunderstorms were experienced in Germany, Poland and Switzerland early in the month which did much damage to the crops and fruit trees, and also interrupted communications. In Italy and Majorca the weather was dry and fine with a rising temperature. Towards the middle of the month the heat

wave spread over the whole of central Europe, temperatures over 90°F. being experienced in many places. Forest fires broke out in the eastern Pyrenees about the 20th. On the 19th the village of Oberammergau was flooded owing to a violent thunderstorm accompanied by heavy rain. Much damage was also done by a thunderstorm in the Savoy mountains on the 22nd. The fine weather continued generally until about the 30th, but the drought caused serious damage to the crops in Italy and Turkey. Forest fires occurred near Golling (Austria) from the 27th-31st.

The monsoon strengthened considerably on the 5th and rains fell generally in most of the Indian provinces; 14in. were measured at Colaba Observatory from the 1st to 7th. Towards the end of the month the Punjab was suffering from abnormal heat and humidity. In Burma the monsoon was unusually heavy, and Mandalay was flooded on the 21st while gales did damage at Tavoy, Moulmein and Rangoon. Blagoveshchensk (Siberia) and fifty villages in the Amur regions were flooded on the 31st, owing to the rising of the rivers.

A heat wave prevailed in Algeria during the first week of the month and forest fires occurred.

Good general rains fell in the agricultural districts of South Australia during the middle of the month.

The weather in Canada throughout the month was favourable for the growth of crops which were doing well. A severe heat wave occurred in New York from about the 9th to 20th with an interval of somewhat cooler weather about the 13th and 14th. Owing to the drought in Mexico many cattle died and the crops were burnt. Fine cold weather was experienced in Buenos Aires on the 1st to 5th proving beneficial for the crops. Heavy rain from the 28th to 31st caused further landslips at Santos (Brazil).

The special message from Brazil states that rain was scarce in the north being 1·93in. below normal, but in the centre it was plentiful being 2·01in. above normal and in the south it was 0·67in. above normal. The circulation was less active and three anticyclones passed over the country. During the last three weeks the temperature in the south was very low. Crops were generally in good condition, cotton, sugar cane, tobacco, cocoa and coffee were reaped. At Rio de Janeiro pressure was 0·6mb. above normal and temperature was 0·5°F. above normal.

Rainfall, July, 1928—General Distribution

England and Wales ...	71	per cent. of the average 1881-1915.
Scotland	91	
Ireland	63	
British Isles	74	

Rainfall: July, 1928: England and Wales

Co.	Station	In.	Per-cent of Av.	Co.	Station	In.	Per-cent. of Av.
Lond .	Camden Square	2·12	89	*Leics* .	Thornton Reservoir ...	1·19	48
Sur .	Reigate, The Knowle...	1·61	77	,, .	Belvoir Castle............	1·15	47
Kent .	Tenterden, Ashenden...	1·11	53	*Rut* .	Ridlington	1·52	...
,, .	Folkestone, Boro. San.	1·16	...	*Linc* .	Boston, Skirbeck	1·23	56
,, .	Margate, Cliftonville...	·98	49	,, .	Lincoln, Sessions House	·90	41
,, .	Sevenoaks, Speldhurst	1·92	...	,, .	Skegness, Marine Gdns	·94	43
Sus .	Patching Farm	2·04	85	,, .	Louth, Westgate	1·05	42
,, .	Brighton, Old Steyne	1·95	89	,, .	Brigg, Wrawby St. ...	·47	...
,, .	Tottingworth Park ...	1·61	64	*Notts* .	Worksop, Hodsock ...	·49	22
Hants.	Ventnor, Roy. Nat. Hos.	3·00	149	*Derby* .	Derby	1·33	56
,, .	Fordingbridge, Oaklnds	1·65	83	,, .	Buxton, Devon Hos....	2·07	53
,, .	Ovington Rectory	1·63	63	*Ches* .	Runcorn, Western Pt.	2·05	75
,, .	Sherborne St. John ...	1·49	67	,, .	Nantwich, Dorfold Hall	2·01	...
Berks .	Wellington College ...	1·44	70	*Lancs* .	Manchester, Whit. Pk.	1·77	54
,, .	Newbury, Greenham...	1·78	80	,, .	Stonyhurst College ...	3·41	88
Herts .	Benington House	2·19	90	,, .	Southport, Hesketh Pk	2·68	94
Bucks.	High Wycombe	2·69	137	,, .	Lancaster, Strathspey	4·97	...
Oxf . .	Oxford, Mag. College	1·83	81	*Yorks*.	Wath-upon-Dearne ...	·43	17
Nor .	Pitsford, Sedgebrook...	2·47	105	,, .	Bradford, Lister Pk....	·78	28
,, .	Oundle	1·98	...	,, .	Oughtershaw Hall......	4·73	...
Beds .	Woburn, Crawley Mill	2·57	115	,, .	Wetherby, Ribston H.	·90	36
Cam .	Cambridge, Bot. Gdns.	...	...	,, .	Hull, Pearson Park ...	·50	21
Essex .	Chelmsford, County Lab	1·74	82	,, .	Holme-on-Spalding ...	·65	...
,, .	Lexden, Hill House ...	1·66	...	,, .	West Witton, Ivy Ho.	·65	...
Suff .	Hawkedon Rectory ...	2·63	108	,, .	Felixkirk, Mt. St. John	·61	22
,, .	Haughley House	2·12	...	,, .	Pickering, Hungate ...	·67	...
Norf .	Beccles, Geldeston	...	...	,, .	Scarborough	1·01	42
,, .	Norwich, Eaton..... ...	1·96	76	,, .	Middlesbrough	1·17	46
,, .	Blakeney.................	1·62	75	,, .	Baldersdale, Hury Res.	1·37	...
,, .	Little Dunham	2·29	83	*Durh* .	Ushaw College	1·49	53
Wilts.	Devizes, Highclere......	2·43	105	*Nor* .	Newcastle, Town Moor	1·58	60
,, .	Bishops Cannings	2·57	103	,, .	Bellingham, Highgreen	2·04	...
Dor .	Evershot, Melbury Ho.	2·17	86	,, .	Lilburn Tower Gdns....	1·08	...
,, .	Creech Grange	1·68	...	*Cumb* .	Geltsdale..................	5·03	...
,, .	Shaftesbury, Abbey Ho.	2·26	88	,, .	Carlisle, Scaleby Hall	3·94	121
Devon.	Plymouth, The Hoe ..	1·89	69	,, .	Borrowdale, Rosthwaite	9·49	...
,, .	Polapit Tamar	2·16	80	,, .	Keswick, High Hill ...	5·22	...
,, .	Ashburton, Druid Ho.	1·95	64	*Glam* .	Cardiff, Ely P. Stn. ...	2·10	68
,, .	Cullompton...............	2·06	77	,, .	Treherbert, Tynywaun	5·38	...
,, .	Sidmouth, Sidmount...	1·50	60	*Carm* .	Carmarthen Friary ...	3·27	93
,, .	Filleigh, Castle Hill ...	2·51	...	,, .	Llanwrda, Dolaucothy	3·14	72
,, .	Barnstaple, N. Dev. Ath.	2·29	85	*Pemb* .	Haverfordwest, School	3·28	103
Corn .	Redruth, Trewirgie ...	1·63	53	*Card* .	Aberystwyth	3·89	...
,, .	Penzance, Morrab Gdn.	1·65	61	,, .	Cardigan, County Sch.	2·55	...
,, .	St. Austell, Trevarna...	1·86	56	*Brec* .	Crickhowell, Talymaes	3·00	...
Soms .	Chewton Mendip	3·39	97	*Rad* .	Birm W. W. Tyrmynydd	3·62	88
,, .	Long Ashton	3·17	...	*Mont* .	Lake Vyrnwy............	2·01	59
,, .	Street, Hind Hayes ...	2·36	...	*Denb* .	Llangynhafal............	1·04	...
Glos. .	Cirencester, Gwynfa ...	2·69	104	*Mer* .	Dolgelly, Bryntirion...	6·81	160
Here .	Ross, Birchlea............	1·45	64	*Carn* .	Llandudno	1·08	45
,, .	Ledbury, Underdown	1·38	61	,, .	Snowdon, L. Llydaw 9	12·53	...
Salop .	Church Stretton.........	1·33	54	*Ang* .	Holyhead, Salt Island	1·79	69
,, .	Shifnal, Hatton Grange	1·04	46	,, .	Lligwy.....................	••	...
Worc .	Ombersley, Holt Lock	1·14	53	*Isle of Man*			
,, .	Blockley, Upton Wold	1·91	79		Douglas, Boro' Cem....	3·10	101
War .	Farnborough	2·40	94	*Guernsey*			
,, .	Birminghm, Edgbaston	1·26	54		St. Peter P't. Grange Rd.	·61	30

Rainfall: July, 1928: Scotland and Ireland

Co.	Station	In.	Per-cent of Av.	Co.	Station	In.	Per-cent of Av.
Wigt.	Stoneykirk, Ardwell Ho	1·60	55	*Suth.*	Loch More, Achfary ...	8·78	164
,,	Pt. William, Monreith	...	...	*Caith.*	Wick	2·17	83
Kirk.	Carsphairn, Shiel.	3·40	...	*Ork.*	Pomona, Deerness	2·31	90
,,	Dumfries, Cargen	3·97	123	*Shet.*	Lerwick	2·03	89
Dumf.	Eskdalemuir Obs.	5·24	128	*Cork.*	Caheragh Rectory	2·68	...
Roxb.	Branxholm	2·13	71	,,	Dunmanway Rectory...	2·22	57
Selk.	Ettrick Manse	3·64	...	,,	Ballinacurra	1·18	42
Peeb.	West Linton	2·98	...	,,	Glanmire, Lota Lo. ...	1·38	48
Berk.	Marchmont House	1·58	52	*Kerry.*	Valentia Obsy.	2·00	53
Hadd.	North Berwick Res. ...	1·93	75	,,	Gearahameen	2·90	...
Midl.	Edinburgh, Roy. Obs.	2·11	80	,,	Killarney Asylum	1·81	54
Ayr	Kilmarnock, Agric. C.	2·52	81	,,	Darrynane Abbey	2·16	57
,,	Girvan, Pinmore	2·56	70	*Wat.*	Waterford, Brook Lo...	·93	29
Renf.	Glasgow, Queen's Pk.	2·44	84	*Tip.*	Nenagh, Cas. Lough...	2·39	76
,,	Greenock, Prospect H.	4·70	120	,,	Roscrea, Timoney Park	·97	...
Bute	Rothesay, Ardencraig.	4·13	104	,,	Cashel, Ballinamona...	1·04	36
,,	Dougarie Lodge	2·27	...	*Lim.*	Foynes, Coolnanes	2·41	78
Arg.	Ardgour House	12·20	...	,,	Castleconnel Rec.	2·30	...
,,	Manse of Glenorchy ...	7·95	...	*Clare*	Inagh, Mount Callan...	5·42	...
,,	Oban	4·77	...	,,	Broadford, Hurdlest'n.	2·83	...
,,	Poltalloch	3·99	97	*Wexf.*	Newtownbarry	1·03	...
,,	Inveraray Castle...	7·47	150	,,	Gorey, Courtown Ho ..	1·29	44
,,	Islay, Eallabus	4·09	118	*Kilk.*	Kilkenny Castle	·74	26
,,	Mull, Benmore	14·10	...	*Wic.*	Rathnew, Clonmannon	·92	...
,,	Tiree	2·36	...	*Carl.*	Hacketstown Rectory..	1·59	46
Kinr.	Loch Leven Sluice	1·69	59	*Q.Co.*	Blandsfort House	1·53	49
Perth.	Loch Dhu	5·65	117	,,	Mountmellick	1·46	...
,,	Balquhidder, Stronvar	4·13	...	*K.Co.*	Birr Castle	2·11	72
,,	Crieff, Strathearn Hyd.	1·55	52	*Dubl.*	Dublin, FitzWm. Sq...	1·17	46
,,	Blair Castle Gardens ...	1·16	45	,,	Balbriggan, Ardgillan.	1·30	48
Forf.	Kettins School	·65	28	*Me'th.*	Beaupare, St. Cloud...	1·73	...
,,	Dundee, E. Necropolis	1·09	40	,,	Kells, Headfort	1·99	63
,,	Pearsie House	1·85	...	*W.M.*	Moate, Coolatore	1·63	...
,,	Montrose, Sunnyside...	2·16	82	,,	Mullingar, Belvedere..	2·02	64
Aber.	Braemar, Bank	1·69	105	*Long.*	Castle Forbes Gdns.	2·09	67
,,	Logie Coldstone Sch....	1·93	65	*Gal.*	Ballynahinch Castle ...	3·81	92
,,	Aberdeen, King's Coll.	2·09	74	,,	Galway, Grammar Sch.	3·31	...
,,	Fyvie Castle	1·37	...	*Mayo*	Mallaranny	4·74	...
Mor.	Gordon Castle	2·71	85	,,	Westport House	2·16	70
,,	Grantown-on-Spey	2·95	96	,,	Delphi Lodge	6·58	...
Na.	Nairn, Delnies	1·86	69	*Sligo*	Markree Obsy.	1·95	56
Inv.	Ben Alder Lodge	...	...	*Cav'n.*	Belturbet, Cloverhill...	2·23	71
,,	Kingussie, The Birches	2·02	...	*Ferm.*	Enniskillen, Portora...	...	...
,,	Loch Quoich, Loan ...	16·30	...	*Arm.*	Armagh Obsy.	1·59	55
,,	Glenquoich	12·83	200	*Down.*	Fofanny Reservoir	2·86	...
,,	Inverness, Culduthel R.	1·80	...	,,	Seaforde	2·52	79
,,	Arisaig, Faire-na-Squir	4·19	...	,,	Donaghadee, C. Stn ...	2·62	94
,,	Fort William	7·52	...	,,	Banbridge, Milltown...	1·54	47
,,	Skye, Dunvegan	4·97	...	*Antr.*	Belfast, Cavehill Rd ...	2·85	...
R & C.	Alness, Ardross Cas. ...	1·93	64	,,	Glenarm Castle	2·31	...
,,	Ullapool	4·19	...	,,	Ballymena, Harryville	3·20	93
,,	Torridon, Bendamph...	6·80	125	*Lon.*	Londonderry, Creggan	3·29	90
,,	Achnashellach	8·19	...	*Tyr.*	Donaghmore	1·83	...
,,	Stornoway	3·05	101	,,	Omagh, Edenfel	2·50	74
Suth.	Lairg	2·47	...	*Don.*	Malin Head	2·47	87
,,	Tongue	2·14	70	,,	Dunfanaghy	2·67	...
,,	Melvich	2·85	102	,,	Killybegs, Rockmount.	3·31	75

Climatological Table for the British Empire, February, 1928.

STATIONS	PRESSURE Mean of Day M.S.L.	PRESSURE Diff. from Normal	TEMPERATURE Absolute Max.	TEMPERATURE Absolute Min.	TEMPERATURE Mean Values Max.	TEMPERATURE Mean Values Min.	TEMPERATURE Mean Values ½ max. and min.	TEMPERATURE Mean Values Diff. from Normal	TEMPERATURE Mean Wet Bulb	Relative Humidity	Mean Cloud Am'nt	PRECIPITATION Am'nt	PRECIPITATION Diff. from Normal	PRECIPITATION Days	BRIGHT SUNSHINE Hours per day	BRIGHT SUNSHINE Percentage of possible
	mb.	mb.	° F.	° F.	° F.	° F.	° F.	° F.	° F.	%	0—10	in.	in.			
London, Kew Obsy	1019·7	+ 3·7	56	28	50·2	37·6	43·9	+ 3·8	38·5	88	7·0	1·40	– 0·14	13	3·0	30
Gibraltar	1025·5	+ 5·5	66	44	60·9	50·5	55·7	– 0·2	50·3	84	5·0	3·22	– 1·00	7	..	..
Malta	1020·5	+ 3·8	61	44	57·0	50·4	53·7	– 1·6	50·1	79	6·8	4·59	+ 2·39	11	5·5	51
St. Helena	1012·7	+ 3·1	72	59	69·6	61·4	65·5	– 0·9	62·6	95	8·7	1·96	– 1·84	17	..	..
Sierra Leone	1012·0	+ 1·2	91	68	88·5	72·6	80·5	– 1·8	67·7	54	2·3	0·00	– 0·30	0	..	..
Lagos, Nigeria	1009·2	– 0·9	92	70	88·0	76·3	82·1	– 0·1	73·0	72	7·7	2·22	+ 0·15	2	..	..
Kaduna, Nigeria	1015·1	+ 3·1	94	..	89·5	..	..	..	65·4	55	1·5	0·00	– 0·04	0	..	..
Zomba, Nyasaland	1008·8	+ 0·9	92	57	84·3	63·0	73·7	+ 1·7	..	76	5·1	3·41	– 7·24	6	..	..
Salisbury, Rhodesia	1009·5	+ 0·6	90	49	82·5	57·6	70·1	+ 1·3	62·2	60	3·6	3·51	– 3·89	6	9·8	77
Cape Town	1015·5	+ 2·1	98	47	80·7	61·8	71·3	+ 1·0	61·7	70	2·6	0·41	– 0·17	3	..	..
Johannesburg	1012·8	+ 1·0	82	46	75·3	55·4	65·3	– 0·1	57·9	72	4·0	5·67	+ 0·45	15	7·9	61
Mauritius	1010·4	– 0·6	91	72	85·3	74·3	79·8	+ 0·5	77·4	78	6·3	14·41	+ 6·01	22	8·2	65
Bloemfontein	..	..	89	44	81·8	57·9	69·9	– 2·0	59·7	64	3·8	2·12	– 1·33	9	..	..
Calcutta, Alipore Obsy.	1013·8	+ 0·5	91	57	85·0	62·0	73·5	+ 2·5	60·8	76	2·0	0·03	– 1·07	1*	..	..
Bombay	1012·3	– 0·4	90	60	82·4	67·2	74·8	– 0·8	64·2	72	0·8	0·01	– 0·02	0*	..	..
Madras	1013·2	+ 0·3	91	65	86·8	70·1	78·5	+ 0·8	72·4	81	2·6	1·12	+ 0·80	2*	..	..
Colombo, Ceylon	1011·6	+ 0·5	91	66	87·0	70·3	78·7	– 1·0	73·9	71	2·4	2·78	+ 0·71	7	9·5	80
Hongkong	1020·2	+ 1·5	71	45	63·1	55·0	59·1	0·0	55·0	80	8·7	3·57	+ 1·97	7	2·5	22
Sandakan	..	..	89	73	87·0	75·6	81·3	+ 1·2	77·1	86	..	29·50	+ 19·88	21	..	..
Sydney	1013·4	– 0·7	85	61	78·4	67·7	73·1	+ 1·8	69·5	79	7·6	6·91	+ 2·67	18	5·5	41
Melbourne	1014·4	– 0·1	99	50	77·7	60·4	69·1	+ 1·7	62·2	67	6·9	4·57	+ 2·85	11	6·0	46
Adelaide	1014·5	+ 0·2	103	50	81·8	59·6	70·7	– 3·4	59·8	44	3·7	2·51	+ 1·85	3	9·3	70
Perth, W. Australia	1014·6	+ 1·6	99	54	84·3	61·5	72·9	– 1·2	61·2	47	2·4	0·01	– 0·44	1	10·5	80
Coolgardie	1013·7	+ 1·2	113	52	89·1	57·9	73·5	– 2·5	58·9	43	3·1	0·78	+ 0·03	4	..	..
Brisbane	1012·1	– 0·4	87	67	81·6	70·3	75·9	– 0·6	71·8	80	8·5	16·12	+ 9·93	26	4·3	33
Hobart, Tasmania	1015·1	+ 1·6	86	47	70·2	61·6	65·9	+ 3·5	56·1	66	7·0	1·28	– 0·17	13	6·0	44
Wellington, N.Z.	1019·6	+ 3·8	79	45	71·1	56·4	63·7	+ 1·2	60·4	78	6·6	3·58	+ 0·44	7	6·5	48
Suva, Fiji	1009·9	+ 2·2	91	71	85·7	74·8	80·3	– 0·2	76·0	83	7·6	12·87	+ 2·74	22	5·1	40
Apia, Samoa	1011·9	+ 3·5	89	75	86·1	76·3	81·2	+ 2·2	78·2	80	5·2	21·70	+ 5·99	20	7·1	57
Kingston, Jamaica	1015·7	+ 0·4	89	65	85·4	68·1	76·7	+ 0·2	65·8	83	2·2	0·20	– 0·40	1	5·2	45
Grenada, W.I.	1010·5	– 2·8	89	70	85·2	72·2	78·7	+ 1·6	72·9	77	5·0	2·12	– 0·66	18	..	..
Toronto	1017·2	– 0·8	43	– 4	30·8	17·4	24·1	+ 2·4	20·2	75	6·7	1·67	– 0·91	15	4·1	39
Winnipeg	1019·6	– 2·2	39	–16	20·6	4·5	12·5	+13·1	..	..	5·0	0·18	– 0·66	5	5·2	52
St. John, N.B.	1015·3	+ 1·2	41	– 7	27·4	9·6	18·5	– 1·4	13·8	59	6·0	2·35	– 1·55	13	4·5	44
Victoria, B.C.	1023·2	+ 7·3	53	34	47·0	38·4	42·7	+ 2·4	40·5	92	7·2	0·45	– 3·08	9	3·6	36

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